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Lake Thunderbird
Cleveland County, Oklahoma

National Eutrophication Survey, Las Vegas, Nev

Prepared for

Environmental Monitoring and Support Lab, Las Vegas, Nev

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U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL EUTROPHICATION SURVEY

WORKING PAPER SERIES

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and
ENVIRONMENTAL MONITORING & SUPPORT LABORATORY - LAS VEGAS, NEVADA

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Report
on
Lake Thunderbird
Cleveland County
Oklahoma
EPA Region VI
Working Paper No. 594

With the cooperation of the
Oklahoma Department of Pollution Control
and the
Oklahoma National Guard
March, 1977

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16. ABSTRACT:

Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivided according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

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REPORT ON LAKE THUNDERBIRD

CLEVELAND COUNTY, OKLAHOMA

EPA REGION VI

by

National Eutrophication Survey

Water and Land Monitoring Branch
Monitoring Applications Laboratory
Environmental Monitoring & Support Laboratory
Las Vegas, Nevada

and

Eutrophication Survey Branch
Corvallis Environmental Research Laboratory
Corvallis, Oregon

Working Paper No. 594

OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY

March 1977

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FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to freshwater lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point source discharge reduction and nonpoint source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's freshwater lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by the U.S. Environmental Protection Agency and to augment plans implementation by the states.

ACKNOWLEDGMENTS

The staff of the National Eutrophication Survey (Office of Research and Development, U.S. Environmental Protection Agency) expresses sincere appreciation to the Oklahoma Department of Pollution Control for professional involvement, to the Oklahoma National Guard for conducting the tributary sampling phase of the Survey, and to those Oklahoma wastewater treatment plant operators who provided effluent samples and flow data.

Dr. Denver Talley, Director, Oklahoma Department of Pollution Control; the staff of the Oklahoma Water Resources Board; and the staff of the Oklahoma State Department of Health reviewed the preliminary reports and provided critiques most useful in the preparation of this Working Paper Series.

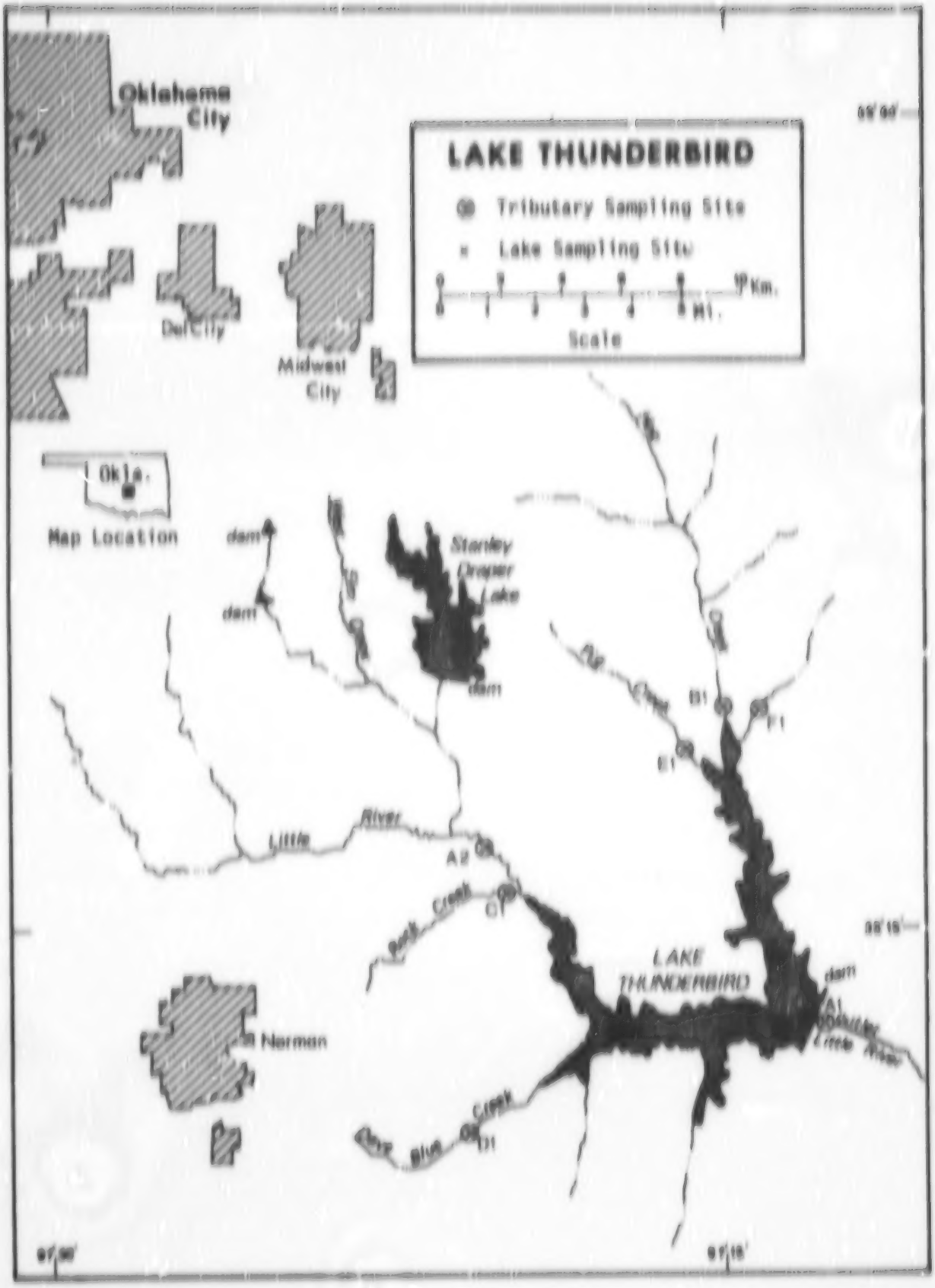
Major General John Coffey, Jr., the Adjutant General of Oklahoma, and Project Officers Colonel Curtis W. Milligan and Major James D. Haney, Jr., who directed the volunteer efforts of the Oklahoma National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF OKLAHOMA

LAKE NAME	COUNTY
Altus Reservoir	Greer, Kiowa
Arbuckle Lake	Murray
Lake Elsworth	Caddo, Comanche
Lake Eufaula	Haskell, McIntosh, Okmulgee, Pittsburg
Fort Cobb Reservoir	Caddo
Fort Supply Reservoir	Woodward
Foss Dam Reservoir	Custer
Lake Francis	Adair
Grand Lake O' The Cherokees	Mayes, Delaware, Craig, Ottawa
Lake Hefner	Oklahoma
Keystone Reservoir	Tulsa, Creek, Osage, Pawnee
Oologah Lake	Nowata, Rogers
Tenkiller Ferry Reservoir	Cherokee, Sequoyah
Lake Thunderbird	Cleveland
Wister Reservoir	Leflore


LAKE THUNDERBIRD
Tributary Sampling Site
Lake Sampling Site
Km.
Mi.
Scale
Oklahoma City
Del City
Midwest City
Okla.
Map Location
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dam
Stanley Draper Lake
dam
Little River
Norman
LAKE THUNDERBIRD
dam
Creek
Creek
Creek
35°30'
35°15'
97°30'
97°15'

REPORT ON LAKE THUNDERBIRD, OKLAHOMA
STORET NO. 4014

I. CONCLUSIONS

A. Trophic Condition:*

Survey data indicate that Lake Thunderbird is eutrophic. Chlorophyll *a* values in the lake ranged from a summertime low of 2.7 µg/l to a high of 13.2 µg/l in spring, with a mean of 8.4 µg/l. Nutrient losses in the samples likely contributed to the low apparent potential for primary productivity estimated by algal assay control yield. Of the 16 Oklahoma lakes sampled in 1974 (including Lake Texoma) 13 had higher median total phosphorus levels, 9 had higher median inorganic nitrogen values, and 12 had higher median orthophosphorus levels than Lake Thunderbird.

Survey limnologists did not report any problem conditions in the lake but did note that it was highly turbid. The direct relationship between Secchi disc depth (light penetration) and chlorophyll *a* levels, often noted in light-limited systems, was not apparent in Lake Thunderbird. It is likely that a significant portion of the turbidity can be attributed to phytoplankton growth in the moderately rich lake.

*See Appendix E.

B. Rate-Limiting Nutrient:

The algal assay results indicate that Lake Thunderbird was limited by available phosphorus at the times of sampling. The lake data, however, suggest that although phosphorus was limiting in March and June nitrogen was limiting to primary production in October.

C. Nutrient Controllability:

1. Point sources -

No known municipal or industrial point sources impacted Lake Thunderbird during the sampling year. The Oklahoma Department of Pollution Control (1975) states that the reservoir currently provides water to Oklahoma City, Del City, Midwest City, and Norman, thus no discharges are allowed to Little Creek upstream of Lake Thunderbird. Septic tanks serving lake shore residences and state parks were estimated to have contributed only 0.1% of the total phosphorus load to the lake. A shoreline survey would be needed, however, to determine the actual contributions of these sources.

The phosphorus loading of 0.32 g $P/m^2/yr$ measured during the sampling year is a little more than twice that proposed by Vollenweider (1975) as a "eutrophic" loading. Any future nutrient contributions should be carefully evaluated as to their potential effect on the water quality of this lake.

F. Nonpoint sources -

Gaged tributaries contributed 73.0% of the total phosphorus load to Lake Thunderbird and ungaged drainage areas were estimated to have contributed 21.5%.

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS

Lake and drainage basin characteristics are itemized below. Lake surface area and mean depth were provided by the Oklahoma Department of Pollution Control; maximum depth was provided by the Oklahoma Water Resources Board. Tributary flow data were provided by the Oklahoma District Office of the U.S. Geological Survey (USGS). Outlet drainage area includes the lake surface area. Mean hydraulic retention time was obtained by dividing the lake volume by mean flow of the outlet. Precipitation values are estimated by means as outlined in National Eutrophication Survey (NES) Working Paper No. 175. A table of metric/English conversions is included as Appendix A.

A. Lake Morphometry:

1. Surface area: 24.56 km^2.
2. Mean depth: 6.0 meters.
3. Maximum depth: 27.7 meters.
4. Volume: 147,360 x 10^6 m^3.
5. Mean hydraulic retention time: 5,330 days (14.6 yrs).

B. Tributary and Outlet:
(See Appendix B for flow data)

1. Tributaries -

Name	Drainage area(km²)	Mean flow (m³/sec)
A-2 Little River	230.5	0.67
B-1 Hog Creek	107.2	0.30
C-1 Rock Creek	29.6	0.07
D-1 Jim Blue Creek	28.3	0.07
Minor tributaries and immediate drainage -	242.2	0.73
Totals	637.7	1.84
2. Outlet - A-1 Little River	662.3	0.32

C. Precipitation:

1. Year of sampling: 79.1 cm.
2. Mean annual: 87.6 cm.

III. LAKE WATER QUALITY SUMMARY

Lake Thunderbird was sampled three times during the open-water season of 1974 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from three stations on the lake and from a number of depths at each station (see map, page v). During each visit, depth-integrated samples were collected from each station for chlorophyll a analysis and phytoplankton identification and enumeration. During the first and last visits, 18.9-liter depth-integrated samples were composited for algal assays. Maximum depths sampled were 16.5 meters at Station 01, 8.2 meters at Station 02, and 8.5 meters at Station 03. For a more detailed explanation of NES methods, see NES Working Paper No. 175.

The results obtained are presented in full in Appendix C and are summarized in III-A for waters at the surface and at the maximum depth for each site. Results of the phytoplankton counts and chlorophyll a determinations are included in III-B. Results of the limiting nutrient study are presented in III-C.

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B. Biological Characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Algal Units per ml
03/30/74	1. Melosira	5,770
	2. Asterionella	344
	3. Chroomonas	115
	4. Kirchneriella	115
	5. Cryptomonas	76
	Other genera	153
	Total	6,573
06/11/74	1. Chroomonas	1,366
	2. Cryptomonas	352
	3. Trachelomonas	132
	4. Anabaena	44
	5. Closterium	44
	Other genera	[illegible]
	Total	1,938
10/23/74	1. Melosira	738
	2. Merismopedia	221
	3. Chroomonas	184
	4. Chlamydomonas	111
	5. Microcystis	111
	Other genera	295
	Total	1,660

E. Chlorophyll a -

Sampling Date	Station Number	Chlorophyll a (ug/l)
03/30/74	01	12.0
	02	11.6
	03	15.2
06/11/74	01	3.6
	02	6.3
	03	2.7
10/23/74	01	5.0
	02	6.6
	03	11.6

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

Spike(mg/l)	Ortho P Conc.(mg/l)	Inorganic N Conc.(mg/l)	Maximum Yield (mg/l-dry wt)
a. 03/30/74			
Control	0.010	0.116	0.1
0.05 P	0.060	0.116	5.2
0.05 P + 1.0 N	0.060	1.116	25.0
1.00 N	0.010	1.116	0.1
b. 10/23/74			
Control	0.010	0.152	0.2
0.05 P	0.060	0.152	3.4
0.05 P + 1.0 N	0.060	1.152	16.4
1.00 N	0.010	1.152	0.5

2. Discussion -

The control yield of the assay alga, Selenastrum capricornutum, indicates that the potential primary productivity in Lake Thunderbird was low at the times of assay sample collection (03/30/74, 10/23/74). However, if nutrients were not lost between sampling and analysis, the control yield would likely have been higher. In both assays, there was a significant increase in yield over that of the control when orthophosphorus was added, indicating phosphorus limitation. The addition of nitrogen alone to the spring sample did not result in an increase in yield over that of the control, although a slight increase was noted in the fall sample with nitrogen addition.

Mean inorganic nitrogen to orthophosphorus (N/P) ratios in the lake data were 17/1 and 14/1 in the spring and summer, suggesting phosphorus limitation, but 10/1 in the fall, suggesting nitrogen was the primary limiting nutrient on that sampling occasion.

IV. NUTRIENT LOADINGS
(See Appendix D for data)

For the determination of nutrient loadings, the Oklahoma National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page v), except for the high runoff months of April and May when two samples were collected. Sampling was begun in November 1974, and was completed in October 1975.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the Oklahoma District Office of the USGS for the tributary sites nearest the lake.

In this report, nutrient loads for sampled tributaries were determined by using a modification of a USGS computer program for calculating stream loadings. Nutrient loads indicated for tributaries are those measured minus known point source loads, if any.

Nutrient loadings for unsampled "minor tributaries and immediate drainage" ("ZZ" of USGS) were estimated by using the mean annual nutrient loads, in $kg/km^2/year$, in Hog Creek, Rock Creek, and Jim Blue Creek at Stations B-1, C-1, and D-1 and multiplying the means by the ZZ area in km^2.

A. Waste Sources:

1. Known municipal - None
2. Known industrial - None

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source		kg P/yr	% of total
a.	Tributaries (nonpoint load)		
	A-2 Little River	4,545	57.7
	B-1 Hog Creek	850	10.8
	C-1 Rock Creek	210	2.7
	D-1 Jim Blue Creek	145	1.8
b.	Minor tributaries and immediate drainage (nonpoint load)	1,695	21.5
c.	Known municipal STP's - None		
d.	Septic tanks* -	8	0.1
e.	Known industrial - None		
f.	Direct precipitation** -	430	5.4
	Totals	7,880	100.0

2. Output - A-1 Little River 440

3. Net annual P accumulation - 7,440

*Estimate based on 15 lakeshore residences and 3 parks.
**Estimated (See NES Working Paper No. 175).

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs-

Source	kg N/yr	% of total
a. Tributaries (nonpoint load)		
A-2 Little River	38,390	36.3
B-1 Hog Creek	10,620	10.0
C-1 Rock Creek	3,365	3.2
D-1 Jim Blue Creek	2,435	2.3
b. Minor tributaries and immediate drainage (nonpoint load) -	24,220	22.9
c. Known municipal STP's - None		
d. Septic tanks* -	255	0.2
e. Known industrial - None		
f. Direct precipitation** -	26,515	25.1
Totals	105,740	100.0
2. Outputs - A-1 Little River	8,235	
3. Net annual N accumulation -	97,505	

*Estimated based on 15 lakeshore residences and 3 parks.
**Estimated (See NES Working Paper No. 175).

D. Mean Annual Nonpoint Nutrient Export by Subdrainage Area:

Tributary	kg P/km^2/yr	kg N/km^2/yr
Little River	20	167
Hog Creek	8	98
Rock Creek	7	113
Jim Blue Creek	6	88

E. Mean Nutrient Concentrations in Ungaged Streams:

Tributary	Mean Total P (mg/l)	Mean Total N (mg/l)
E-1 Pig Creek	0.091	0.939
F-1 Unnamed Stream	0.047	0.858

Nutrient levels for tributaries E-1 and F-1 are in line with the unimpacted gaged tributaries to Lake Thunderbird.

f. Yearly Loadings:

In the following table, the existing phosphorus annual loading is compared to the relationship proposed by Vollenweider (1975). Essentially, his "eutrophic" loading is that at which the receiving waters would become eutrophic or remain eutrophic; his "oligotrophic" loading is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A "mesotraphic" loading would be considered one between "eutrophic" and "oligotruphic".

Note that Vollenweider's model may not be applicable to water bodies with very short retention times or in which light penetration is severely restricted from high concentrations of suspended solids in the surface waters.

	Total Yearly Phosphorus Loading ($g/m^2/yr$)
Estimated loading rate for Lake Thunderbird	0.32
Vollenweider's "eutrophic" loading	0.13
Vollenweider's "oligotrophic" loading	0.06

V. LITERATURE REVIEWED

Oklahoma Department of Pollution Control. 1975. Water Quality Management Plan, Canadian River Basin. Oklahoma City, Oklahoma.

U.S. Environmental Protection Agency. 1971. "Inventory of Wastewater Treatment Facilities" EPA Publication No. OWP-1, Volume 6. Office of Media Programs, Office of Water Programs, Washington, D.C.

U.S. Environmental Protection Agency. 1975. National Eutrophication Survey Methods 1973-1976. Working Paper No. 176. National Environmental Research Center, Las Vegas, Nevada, and Pacific Northwest Environmental Research Laboratory, Corvallis, Oregon.

Vollenweider, R. A. 1975. Input-Output Models With Special Reference to the Phosphorus Loading Concept in Limnology. Schweiz. Z. Hydrol. 37:53-84.

VI. APPENDICES

APPENDIX A
CONVERSION FACTORS

CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107 x 10^{-4} = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 = cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

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APPENDIX B
TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR OKLAHOMA 03/25/77

LAKE CODE 40[illegible] LAKE THUNDERBIRD

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
[illegible]	11	74	[illegible]	3	[illegible]				
	12	74	[illegible]	4	[illegible]				
	1	75	[illegible]	3	[illegible]				
	2	75	[illegible]	5	[illegible]				
	3	75	[illegible]	5	[illegible]				
	4	75	[illegible]	5	[illegible]	29	[illegible]		
	5	75	[illegible]	5	[illegible]	31	[illegible]		
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APPENDIX C

PHYSICAL AND CHEMICAL DATA

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APPENDIX D

TRIBUTARY AND WASTEWATER TREATMENT PLANT DATA

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[illegible]	15	32	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	04	18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	12	09	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	04	17	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	13	38	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	12	19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	17	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	04	29	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	13	09	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	24	42	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	04	40	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	04	18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	16	36	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

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[illegible]

[illegible]

[illegible]

DATE	TIME	DEPTH	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	OF		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TO	DAY	HOUR	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	28	40	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	15	45	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	14	50	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	14	50	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	15	09	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	14	15	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	12	45	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	04	45	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	04	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	13	40	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	09	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	09	15	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]
[illegible]

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APPENDIX E

PARAMETRIC RANKINGS OF LAKES SAMPLED BY NES IN 1974

STATE OF OKLAHOMA

[illegible] DATA TO BE INPUT IN FREEFORM

[illegible] CODE	[illegible] NAME	[illegible] TOTAL P	[illegible] INDEX B	[illegible] [illegible] SEC	[illegible] CALIBA	[illegible] [illegible] FO	[illegible] [illegible] SURFACE [illegible]
[illegible]	[illegible] [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] LAKE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	LAKE [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

AEROBIC OF LAKES <ITI> <ORG> VALUES (NUMB> OF LAKES <ITI> <ORG> VALUES)

LAKE CODE	LAKE LAKE	<ETCAA TOTAL P	<ETCAA INORG N	SUB> <EAA SEC	<EAA CHLORA	IS> <EA NO	<ETCAA ZOOS ORTHO P
4041	ALTAS <FEERATO	43 (90	100 (251	47 (79	13 (23	80 (110	73 (123
4032	THRONLE LAKE	100 (250	40 (130	93 (240	53 (80	33 (43	90 (140
4053	LAKE ELLSWORT>	47 (123	90 (130	40 (123	33 (53	60 (40	47 (170
4074	LAKE SUPERIA	27 (30	30 (50	27 (43	100 (252	47 (70	30 (40
4035	FORT CO<< RESERVOIR	73 (110	73 (113	97 (130	7 (13	60 (113	47 (100
4096	FORT HARRLY RESERVOIR	30 (50	67 (160	0 (80	27 (43	100 (252	60 (90
4067	FOSS LA< RESERVOI<	93 (140	60 (123	60 (90	87 (130	60 (113	160 (250
4070	LAKE FARGES	0 (80	0 (80	7 (10	47 (70	93 (240	7 (13
4094	GRAND LAKE OF THE CHEAM	13 (20	7 (13	40 (60	60 (90	20 (30	13 (20
4010	LAKE <FNE>	43 (70	40 (60	47 (100	73 (123	67 (100	20 (30
4122	<EYSTONE RESERVOI<	7 (23	13 (22	13 (20	0 (80	13 (20	0 (80
4132	SPLOSH< LAKE	40 (60	20 (30	20 (30	60 (120	30 (40	27 (40
4013	TRAQUILTY PENDY RESERVOI<	67 (100	27 (40	100 (250	67 (100	3 (80	50 (70
4014	LAKE THUNDERPIPE	67 (130	60 (90	53 (80	40 (60	53 (80	60 (120
4125	<ISTY RESERVOI<	27 (40	47 (70	33 (50	93 (240	3 (20	40 (60
4026	TEAMA LAKE	53 (80	53 (80	73 (110	20 (30	33 (40	50 (70